Polysigned T12 and Three Flies

Tercedent

The author of the polysigned numbers ゴールデン・P・ティム is inside the creases, nooks and crannies of the Cartesian Labyrinth, and some of its elements, the cartesian product, pairwise interactions, homogeneous and heterogeneous relations, cartesian coordinates and linear independence. On the other side of the fence, other water flows, axes cohabiting and coexisting in the same dimentia, spaces with overloaded components, sharing, dancing, interdependent, intertwined with each other.

ゴールデン 's attack on the cartesian primordial soup is not done merely on the basis of the difference in degrees, so to speak, 120° against 90°, which is rather an important topic by itself, rather a critique regarding the cartesian geometry and its sprouts, namely, ramifications into foundational, lingua franca and abstract modern mathematics, very especially, set theory, but not any concept boasting the cartesian adjective.

ゴールデン has also talked about the topics of closure and the infinite, decimal separator and ellipsis, as well as about reconciling the mathematical substrate and the computational substrate, to name a few.

Confident in a middle ground, the author bets on the T12 system, the creature of study for such purpose, a happy medium between Descartes and Desgoldes, the line and the ray, the perpendicular and the tertendicular, hand in hand. A brief description of some elemental features of the T12 system will ensue, together with coordinates for describing the positions of ants in the plane and flies on the space, and, brief comments regarding the topic of three-stances.

Slightly more than twenty years has passed since the first reachable posts of ゴールデン. The final section of this article is directed to offer a series of possible lines of research, and open challenges for curious readers. Originally was just one set of thirty problems, but, the corresponding polysigned anniversary has been happened more or less recently, a situation worthy of healthy tavern-like celebration.

In addition, ゴールデン is about to secretly undertake the initial studies for his future work 'On Polysigns and Polyalic Structures : The abstract and the concrete of ternialic mathematics, material sciences and beyond'.

Basic features of the T12 Numbers

If addition is represented under the Golden's metaphor as a zero-like symbol @
then one can write a T12 number as

z := 一a @ ＋b @ ＊c @ ＃d @ 生e @ 兆f @ 花g @ 幸h @ 逃m @ 恋n @ 渓p @ 業q

z := (1)a @ (2)b @ (3)c @ (4)d @ (5)e @ (6)f @ (7)g @ (8)h @ (9)m @ (10)n @ (11)p @ (12)q

or in T12 Coordinates

z := (a,b,c,d,e,f,g,h,m,n,p,q)

Addition of two T12 terms with equal sign := (s)x @ (s)y = (s) $x_{@}y$

Addition of two T12 numbers (coordinated format)

$z1 = (a_1,b_1,c_1,d_1,e_1,f_1,g_1,h_1,m_1,n_1,p_1,q_1)$
$z2 = (a_2,b_2,c_2,d_2,e_2,f_2,g_2,h_2,m_2,n_2,p_2,q_2)$

$z1$ @ $z2$ = (a_1@a_2, b_1@b_2, c_1@c_2, d_1@d_2, e_1@e_2, f_1@f_2, g_1@g_2, h_1@h_2, m_1@m_2, n_1@n_2, p_1@p_2, q_1@q_2)

Multiplication between a magnitude μ and a T12 number (magnitudinal multiplication, or stretching)
μ.(a,b,c,d,e,f,g,h,m,n,p,q) = (μa,μb,μc,μd,μe,μf,μg,μh,μm,μn,μp,μq)

Multiplication between a magnitude μ and a T12 term
μ.(s)x = (s)μx

(Vector) Negation of a T12 number (subp2 style)
~z = ~.(a,b,c,d,e,f,g,h,m,n,p,q) = (g,h,m,n,p,q,a,b,c,d,e,f)

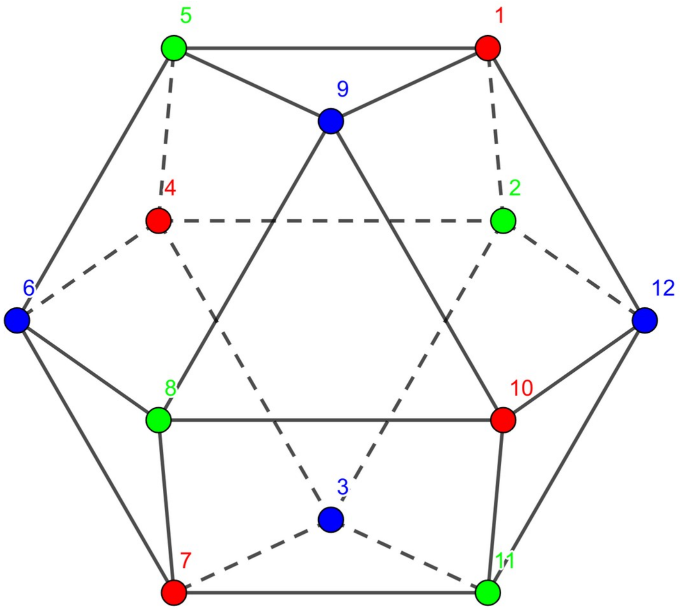
(Vector) Negation of a T12 term ~(s)m = (s@6)m (mod 12)

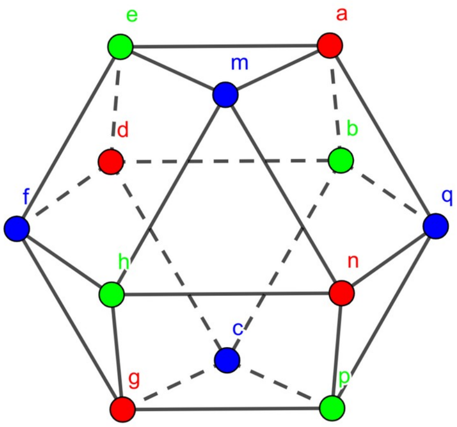
The two families of p3 subtriples

A T12 duodecuple can be uncoupled into four subtriples, in two different ways

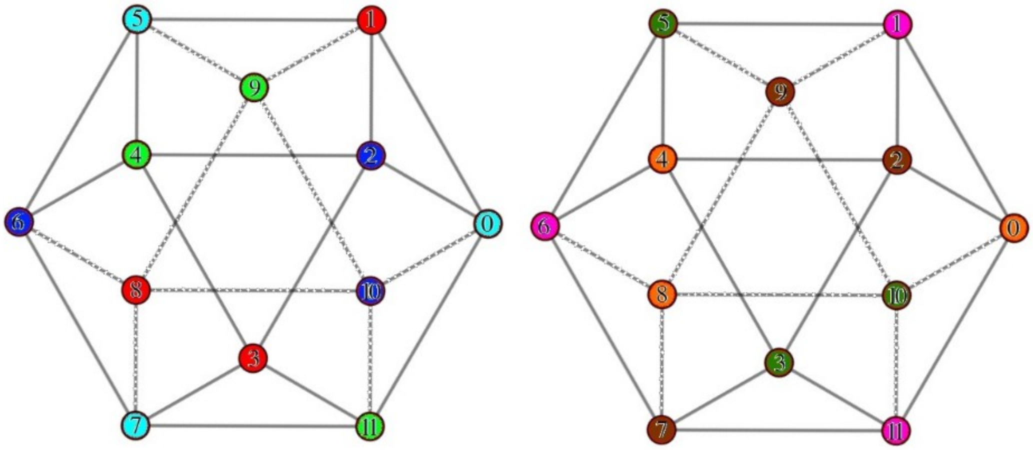
⊲ahc **(a,h,c)**
⊲dpm **(d,p,m)**
⊲nbf **(n,b,f)**
⊲geq **(g,e,q)**

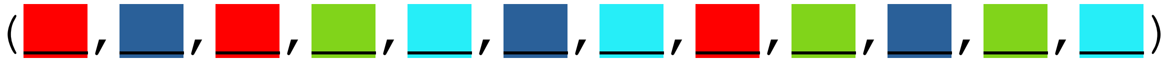
⊳gbm **(g,b,m)**
⊳nec **(n,e,c)**
⊳dhq **(d,h,q)**
⊳apf **(a,p,f)**





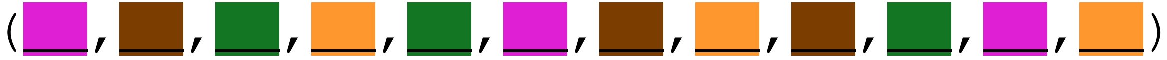
Over and under coloring convention in T12 system, subtriples identified by colour





(a, b, c, d, e, f, g, h, m, n, p, q)

(1, 2, 3, 4, 5, 6, 7, 8, 9,10,11,12)



It can be noticed that each triple ∆xyz is a p3 number. The p3 plane, by definition has 'redundancy' of components. This other capacity of the T12 space adds a second layer of 'redundancy' in other way.

z = (⊲ahc, ⊲dpm, ⊲nbf, ⊲geq) = ((a,h,c) , (d,p,m) , (n,b,f) , (g,e,q))

z = (⊳gbm, ⊳nec, ⊳dhq, ⊳apf) = ((g,b,m) , (n,e,c) , (d,h,q) , (a,p,f))

A T12 duodecuple also can be uncoupled into three quartets, but, just one way of doing it, no two

□adgn □behp □cfmq

z = (□adgn, □behp, □cfmq) = ((a,d,g,n) , (b,e,h,p) , (c,f,m,q))

Notice that each □ is a plane. It is possible to add an operator to rotate in 90°.

Since the cuboctahedron has turns in 90° and 120°, it is home for perpendicularity and tertendicularity.

Ternagation of a T12 number

⊛.(a,b,c,d,e,f,g,h,m,n,p,q) = (a,b,c,d,e,f,g,h,m,n,p,q)

⊖.(a,b,c,d,e,f,g,h,m,n,p,q) = (c,n,h,m,g,b,q,a,p,f,d,e)

⊕.(a,b,c,d,e,f,g,h,m,n,p,q) = (h,f,a,p,q,n,e,c,d,b,m,g)

⧆.(a,b,c,d,e,f,g,h,m,n,p,q) = (a,b,c,d,e,f,g,h,m,n,p,q)

⊟.(a,b,c,d,e,f,g,h,m,n,p,q) = (f,g,e,q,n,p,m,d,b,c,a,h)

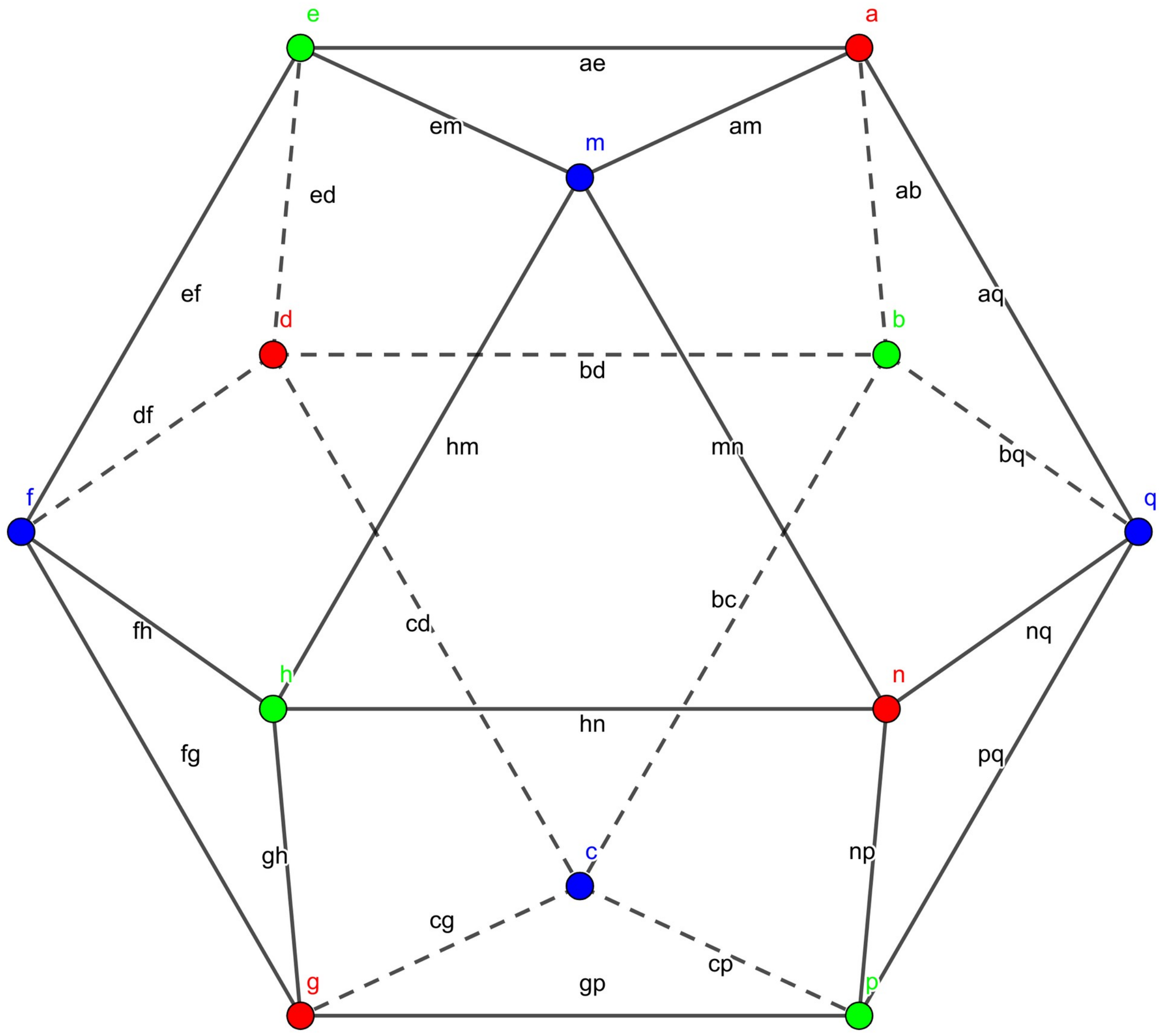
⊞.(a,b,c,d,e,f,g,h,m,n,p,q) = (p,m,n,h,c,a,b,q,g,e,f,d)

Ternagation operators for T12 (imitating p3 ternagation,this is p3 product)
⊖(⊕(z)) = ⊕(⊖(z)) = ⊖(⊖(⊖(z))) = ⊕(⊕(⊕(z))) = ⊛(z) = z

⊟(⊞(z)) = ⊞(⊟(z)) = ⊟(⊟(⊟(z))) = ⊞(⊞(⊞(z))) = ⧆(z) = z

Notice that ⊖,⊕,⊟,⊞ applied to a T12 number only generate four other T12 numbers, but a point in space has associated infinite values through its centred (p3) equilateral cone, that can be obtained combining ⊖,⊕,⊟ and ⊞ in specific ways in order to reach the circle containing ⊖z,⊕z,⊟z and ⊞z.

Magnitude of a T12 number



/(a,b,c,d,e,f,g,h,m,n,p,q)/ =

$$a^2 + b^2 + c^2 + d^2 + e^2 + f^2 + g^2 + h^2 + m^2 + n^2 + p^2 + q^2$$

$$- 2ag - 2bh - 2cm - 2dn - 2ep - 2fq$$

$$ae + am + em + cg + gp + cp + fh + hn + nq + bq + bd + df$$

$$ef + hm + mn + aq + ab + de + fg + gh + np + pq + bc + cd$$

$$-ac - ah - ch - dp - dm - mp - eq - eg - gq - bf - bn - fn$$

$$-af - ap - fp - dq - dh - hq - en - ce - cn - bg - bm - gm$$

In the above statement the symbol + and - plays the role of increment and decrement

It is not necessary to use the two families of p3 reductions (equivalendos) and the family of p2 reductions, but their usage greatly simplify calculations.

One-dimensional Positions of Two Ants

One may write x1 and x2 as the (p2) positions of two ants on a line, ant n°1 and ant n°2. It may be suitable to label the average of the positions as the center $\bar{x}_2$ (or $\bar{x}_0$)
$(1/2)(+x_1 \ @ +x_2) = \bar{x}_2$

The usage of the symbol $\bar{x}$ for the vector substraction (split in two) is justified for reasons of resemblance, almost equal compared to the above average, differing just by a sign change in the first element.
$(1/2)(-x_1 \ @ +x_2) = \bar{x}_1$

If the use of a sign variable s is allowed, both AVGs (averages) may be concisely written in a unified expression
$(1/2)(-x_1 \ @ +x_2) = \bar{x}_1$
$(1/2)(+x_1 \ @ +x_2) = \bar{x}_2$

$(1/2)((s)x_1 \ @ +x_2) = \bar{x}_s$

The reverse path, starting with the AVGs to obtain the positions is
$-\bar{x}_1 \ @ +\bar{x}_2 = x_1$
$+\bar{x}_1 \ @ +\bar{x}_2 = x_2$

The above two expressions written in a unified expression
$(s)\bar{x}_1 \ @ +\bar{x}_2 = x_s$

Inspired in the above expression, it is possible to define a vector-like entity, connecting the initial point (the center), with the two terminal points (A,B as the two extremities), as an ambi-directed vector (or ambivector). A capital S is used to denote that 'all' signs are used, in constrast to the usage of the lowercase s, that indicates 'any' sign.

${}^{<}\overline{AB}^{>} := S.z = \pm z$

The (naked) magnitude of ${}^{<}\overline{AB}^{>}$ $\quad / {}^{<}\overline{AB}^{>} / = 2./z/$
The absolute value of ${}^{<}\overline{AB}^{>}$ $\quad | {}^{<}\overline{AB}^{>} | = 2.|z|$
The tweaked build-up of ${}^{<}\overline{AB}^{>}$ $\quad \nparallel {}^{<}\overline{AB}^{>} \nparallel = 2.z$

A discussion over the replacement about the usage of '−' and '+' symbols in the above expressions is prudent, since −z is intended to mean (−1)(z), but, in favour of brevity, −z will be used, in addition for its likeness with vector negation. Other avenue is to implement the usage of '.' as magnitudinal multiplication when required. Extra symbols like ⨹ and ⨺ may be employed.

Towards the Next Dimension

If now, our two ants are wandering in the plane, the expressions that bind together the Xs and $\bar{X}$s can be reused for any tool that covers the plane, this is, intead of $\bar{x}_1$, $\bar{x}_2$, x_1, x_2 being entities in the line, they are now entities of the plane.

If the reader uses Xs and $\bar{X}$s as complex numbers, while jumping to two-dimensions, the only additional works is to extract the real Re() and imaginary Im() components of $\bar{x}_1$, $\bar{x}_2$, x_1 and x_2.

One-trimensional Positions of Three Ants

For the case of the (p3) positions of three ants in the plane, one may write x1,x2 and x3 as the positions of three ants on the plane, ant n°1, ant n°2 and ant n°3. It may be suitable to label the average of the positions, the center $\bar{x}_3$ (or $\bar{x}_0$). Unlike the case with two ants, now we have two tweaked AVGs beside the main center (a two-step mensuration).

$(1/3)(+x_1 @ -x_2 @ \ast x_3) = \bar{x}_1$
$(1/3)(-x_1 @ +x_2 @ \ast x_3) = \bar{x}_2$
$(1/3)(\ast x_1 @ \ast x_2 @ \ast x_3) = \bar{x}_3$

using a sign variable s, the compressed way is
$(1/3)((s@s)x_1 @ (s)x_2 @ {}^{*}x_3) = \bar{x}_s$

The corresponding reverse path is
$-\bar{x}_1 @ +\bar{x}_2 @ \ast\bar{x}_3 = x_1$
$+\bar{x}_1 @ -\bar{x}_2 @ \ast\bar{x}_3 = x_2$
$\ast\bar{x}_1 @ \ast\bar{x}_2 @ \ast\bar{x}_3 = x_3$

Shortening the above into one expression we get
$(s)\bar{x}_1 @ (s_{@}s)\bar{x}_2 @ \ast\bar{x}_3 = x_s$

Inspired in the above expression, it is possible to define a vector-like entity, connecting the initial point (the center), with the three terminal points (A,B,C as the three extremities), an ambi-trirected vector(or amtri-vector).

${}^{<}\overline{ABC}^{>} := (S)t @ (S_{@}S)w$
The (naked) magnitude of ${}^{<}\overline{ABC}^{>}$ $/{}^{<}\overline{ABC}^{>}/ = 3./t/ @ 3./w/$
The absolute value of ${}^{<}\overline{ABC}^{>}$ $|{}^{<}\overline{ABC}^{>}| = 3.|t| @ 3.|w|$
The tweaked build-up of ${}^{<}\overline{ABC}^{>}$ $\nparallel{}^{<}\overline{ABC}^{>}\nparallel = 3.t @ 3.w$

So far, for the definition of ${}^{<}\overline{ABC}^{>}$, it is not clear if instead of adding t and w, a format in 2-tuples

${}^{<}\overline{ABC}^{>} := ((S)t , (S_{@}S)w)$
The (naked) magnitude of ${}^{<}\overline{ABC}^{>}$ $/{}^{<}\overline{ABC}^{>}/ = (3./t/ , 3./w/)$
The absolute value of ${}^{<}\overline{ABC}^{>}$ $|{}^{<}\overline{ABC}^{>}| = (3.|t| , 3.|w|)$
The tweaked build-up of ${}^{<}\overline{ABC}^{>}$ $\nparallel{}^{<}\overline{ABC}^{>}\nparallel = (3.t , 3.w)$

or other type of format is required. The symbols $\overset{@}{,}$ and $\overset{+}{,}$ represent a sort of integrity for the ‘operands’ on the left and the right, a non-cartesian independence, in an additive style

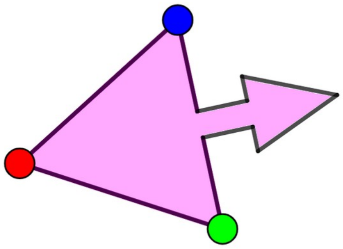
${}^{<}\overline{ABC}^{>} :=((S)t) \overset{@}{,}((S_{@}S)w)$
The (naked) magnitude of ${}^{<}\overline{ABC}^{>}$ $/{}^{<}\overline{ABC}^{>}/=(3./t/)\overset{@}{,}(3./w/)$
The absolute value of ${}^{<}\overline{ABC}^{>}$ $|{}^{<}\overline{ABC}^{>}|=(3.|t|)\overset{@}{,}(3.|w|)$
The tweaked build-up of ${}^{<}\overline{ABC}^{>}$ $\nparallel{}^{<}\overline{ABC}^{>}\nparallel=(3.t)\overset{@}{,}(3.w)$

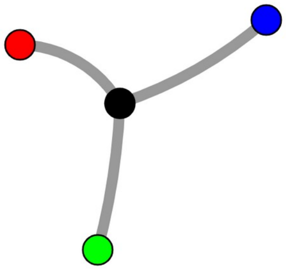
Towards the Next Trimension

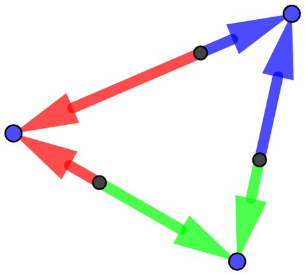
If we endow our three ants with jet packs, we now have three flies (rather, flying ants) wandering in the space, the expressions that bind together the Xs and $\bar{X}$s can be reused for T12 coordinates (or any tool that conveniently covers the space), this is, instead of $\bar{x}_1$, $\bar{x}_2$, $\bar{x}_3$, x_1, x_2, x_3 being entities of the plane, they are now entities of the space. Notice that each element has twelve components. The T12 ternagation uses the symbols ⊖,⊕,⊛,⊟,⊞,⧆, not the usual p3 symbols −,+,∗. For this case, choose the circle, or, the square family.

Tri-mensuration, Tri-stance, Trine-mension

The issue regarding what can be considered a natural analog of distance for three points is not settled. There is vast literature that can be associated to the triangle, and configurations of three points in the plane. The reader may take a look to the Encyclopedia of Triangle Centers of Clark Kimberling, and decide, if some center (and its related geometry) may be used to build some 'ternary version' of distance. What about the centroid, the circumcenter, the isoperimetric point, the midpoint inellipse, the fermat points, the equi-Brocard center, the equal detour point, the trisected perimeter point, etc.







What structural element associated to the triangle is suitable for the task ? What about the angle, the area? why not the perimeter? what happen in the special study cases like collisions (or syzygy) ? Do you take into account differents configurations as deformation of the equilateral triangle? do you separate variables (two-step) ? using a center-to-points strategy (a triangulation point type of geometry ?, what about a point-to-other-two-points type of geometry ? what about segment of a curve, instead of segment of line ? Perhaps you go without threestances, and solved the whole problem, is a solution with symmetry still there ? Maybe you stumble upon a sort of idealized mathematical artifact endowed with supernatural symmetry, but, are you still in the euclidean space? if no, do you have some bridge to the original setting ? Ok, you got your three-stance, how going about using it to organize geometrical regions ? Can you split the space into components or cathetus-like objects ? Are the components and the triagonal connected by a cubic relation ?
There is literature in the area, but, the issue is not settled yet...

Goldner's Puzzles : a synergy of usenetian-lite chores with goldenian emphasis

(1) The Dimentia of P4 rotation
Rotating, circulating components of a p3 number (a,b,c) is associated with tertendicular turns (a 120°/240° turn respect the original number), but, rotation of components of a p4 number (a,b,c,d) is not necessarily associated with quatquandicular (tetrahedrical) turns. What is the mistery behind this ? What is the relation between quatquandicularity and perpendicularity? Is there some structural element hidden in the geometry of the common (or degenerated) tetrahedron ? What does this say about the inner workings of 'tetrahedrical directions' ?

(2) The Conjugate Toolbox and Polysigns
Using techniques of conjugates presented by Israel González Medina in [1], enhance the addition and product in polysign numbers.

(3) Polysigned p4 Fractals
Research fractals in 3d using the conventional p4 product, the Vierergruppe product, the shuriken product[2], or the pacman product[2]. The advisors for this puzzle are the fractalists Chris Thomasson and Yannis Picart.

(4) Mutant AVGs not based on the Arithmetic Mean
Keeping the idea of direct conversion between the X_S and the AVGs($\overline{X}_S$), replace the usage of the arithmetic mean by the harmonic mean $\overline{x}_3 = (3x_1x_2x_3)/(*x_1x_2 @ *x_2x_3 @ *x_3x_1)$
and/or the parallel operator $\overline{x}_3 = (x_1x_2x_3)/(*x_1x_2 @ *x_2x_3 @ *x_3x_1)$

(5) Schinzel Circle à la triangulaire
Research a version of the Schinzel Circle for a hexagonal grid.

(6) Ternary arithmetic and computational complexity
More investigation into the lines of research opened by Kavosh Havaledarnejad[3] regarding ternary algebras and Computational Complexity is needed.

(7) Tropical Homogeneous Coordinates, Two worlds
Tropical homogeneous coordinates are a point of contact between two worlds, the classical and the Tropical. Research functions with tropical homogeneity, where the addition and

product is interpreted in the classical sense, and also, in the tropical sense, with their underlying connections. See [4].

(8) Component-wise Product in triangular coordinates

More research is needed regarding component-wise products in barycentric and trilinear coordinates, and its associated geometry See [5],[6] and related Forum Geometricorum's references.

(9) Clock arithmetic to the third power

Design a clock arithmetic not based on the Cycle graph, rather, based on the 'Tight Cycles'[7] (and 'Loose Cycles') of hypergraphs with 3-hyperedges, with the associated method of triplements.

(10) Research in Hedronometry

In [8], in the section '4. Appendix: Hedronometric Aspects of Perfection', the author, Blue (the hedronometer) writes :

> "A perfect tetrahedron is one in which each edge is orthogonal to its opposite:
>
> (4.1) $OA \perp BC$, $OB \perp CA$, $OC \perp AB$
>
> A tetrahedron satisfying any two orthogonality conditions satisfies all three. Perfection, then, reduces the degrees of freedom in the variation of such a tetrahedron from six to four, which is why face-areas alone suffice to determine a perfect tetrahedron’s shape.
>
> The lore of perfect tetrahedra —also known as “orthocentric” tetrahedra, for their concurrent altitudes— stretches back to the late 1700s, occasionally repeating itself. In 1934, N. A. Court observed [1]: It is impossible to examine the literature on the orthocentric tetrahedron without being struck by the fact that the same properties recur time and again, being rediscovered by various authors quite independently"

Further research about heron-like hedronometric results, pseudofaces and perfect tetrahedra is needed. See [8] and [9].

(11) A family of 'Closed' spirolaterals in 3d

Find the patterns that rule the generation of closed spirolaterals in 3d, with quatquandicular ("tetrahedrical") turns. See [10].

(12) The Paradigm of Torus geometry

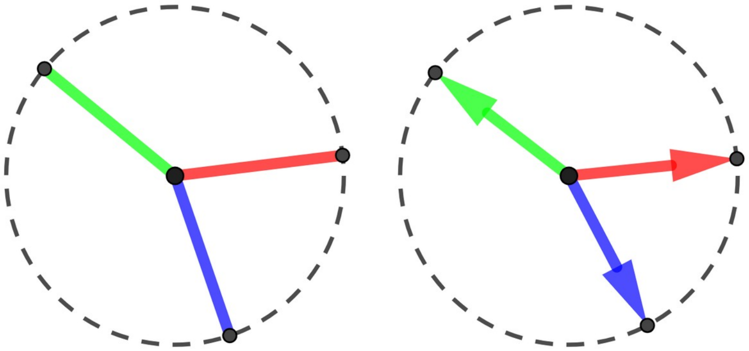
Differing from the usual path of connecting with the spherical paradigm, what is the relation between polysigns and the geometry of the torus? See [11] and [12].

(13) Signon for other Spaces

Find examples of spaces where the concept of Signon[13] can be partially (conventionally or exotically) adapted and landed, and its corresponding relationship with respective equivalence classes.

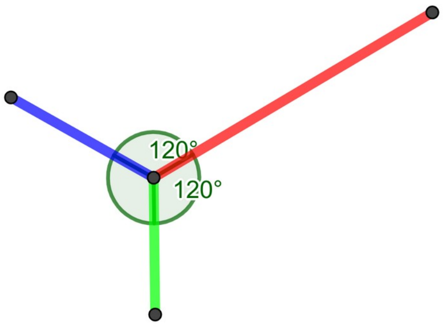
(14) A generalized signon and the circumcircular vector arrangement

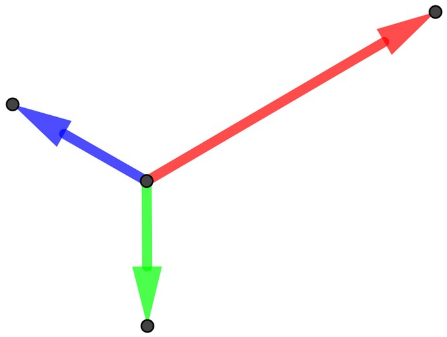
Generalize the concept of signon for three vectors (p3 numbers) in a circumcentrical placement respect each other. What geometrical properties are associated with this type of vector placement ? [Sylvester's triangle problem]



(15) A generalized signon and the equiangular vector arrangement

Generalize the concept of signon for three vector (p3 numbers) in a tertendicular placement respect each other. What geometrical properties are associated with this type of vector placement ? [Steiner's Segment Problem]





(16) Plane triangle geometry, outside the plane !?

Is there some geometric property related to configurations of three points (or restricted to triangles) in the plane, that requires the usage of three-dimensions, not just a plane ?

(17) Synergetics Coordinates vs Quadrays Coordinates

A comprehensive comparison between Synergetics Coordinates and Quadrays for low dimensions is needed. See [14].

(18) Polysigned numbers in MMIX

Implement polysign numbers in the Donald knuth's MMIX.

(19) Triangle-powered Units

We have units like the ETU[16] (equitriangular unit of area) of Wayne Roberts, the tetravolumes[17] of Kirby Urner. Also see the Saber-toothed product[18]. Present research of these units, and research other possible types of units in 2d and 3d.

(20) Definition of Entropy of an Algebra

In the section Outlook of [20], the author writes :

> "Investigation of ZerO as negentropic subspace of a larger number space. In the non-ZerO region or the larger space (Q*\{O*}) “energy” diminishes. In our Physical World, this would imply that ZerO is the region or source of non-diminishing, or self-replenishing, energy, as Muses seems to suggest. Thus, the terms energy or entropy of an algebra would need to be defined much better than Muses used such terms)."

Present a definition of Entropy (after Charles Muses).

(21) Integer polysigns

Do research regarding general properties of Polysigned Integers, with the usual product, and the pacman product. The reader may take [21] as a reference.

(22) Multibase and Irrationals

Research the underlying connection between Multibase Number Systems, and the representation of irrational Numbers, namely, numeric representations of cube roots. See [73] and [74].

(23) Iconic Polysigned Numbers

Present polysigned numbers in the pictorial-diagrammatic-iconic framework of William Bricken, and how the James Number Line, and Depth-value Notation can be used in polysigned endeavors. See [22],[23] and [24].

(24) S-Units and Polysigned Numbers (diophantine mathematics)

What is the relation between polysigned numbers with the machinery of the S-Units ?

(25) Tritonic number system

The number two, the strong-hold of the odd and the even, the positive and the negative, the square and the square-free, are prevalent and omnipresent. Taken inspiration from Leibniz, design a number system for the tritonic integers (integer-like artifacts), taken into account its 3-ordinality, three-sided points, trirected 3-hyperedges, non-binarizable operations of trigits and ternary strings, in a way similar to how the binary number system can code integers. See [25].

(26) Trinversive Geometry
Do a preliminary research to produce a ternalic analog of the Inversion (Inversive Geometry). Advisor for this puzzle is John Gabriel.

(27) Arithmetical dissection of p4 numbers
Having a p4 number - a + b * c # d, what is the role of an additive dissection into subcouples (- a + b) @ (* c # d) ,and a multiplicative dissection into subcouples (- x + y)(- z * w) ?

(28) Betweeness for three points
Implement a definition of betweeness for three points.

(29) Magnitude Sweep Functions
Research the geometry behind Magnitude Sweep Generator Functions presented in [26],[27].

(30) Semi-tropical projective space
Research the geometry of a space endowed with the equivalence (a★k,b★k,c★k), where ★ is the Shinji Tanimoto's hybrid operation[28]. The advisor for this Puzzle is Tommy1729.

Goldeyson's Predicaments : a system of usenetroid-length contests with goldenoid echoe

(1) Dixonians à la Polisigne
In the 1800s, were popularized many mathematical artifacts, including, the eisenstein integers (number theory), and the theorem of Pohlke-and-Schwarz (axonometry). At the time, the projective landscape was more inclined towards multiplicative equivalence classes like (x1, y1, z1) = (λx2, λy2, λz2), not additive ones. Some less known functions are the Dixon elliptic functions[29], a sort of "trigonometry with cubes", over $x^3+y^3=1$, slightly different compared to the circle (like the observed in [30],[31],[32]), endowed with a ternary twin of Pi 5,29991625... (or simply π_3[33]), symmetries under one-thirds, associated cubic roots, and expansions with crazy intertwined coefficients[34],[35]. Also see [36] and [37].

Migrate the Dixon elliptic functions towards the framework of polysigned p3 (over the curve $x^3+y^3+z^3=1$). Is it necessary to infuse the geometry of such a curve directly as a product for p3 numbers ?

(2) The Zero toolchain and Polysigns
The concept of zero/origin is central in polysigns. So far, there is an amount of more conventional (or more exotic) literature regarding zero, like the Calpanic Numbers[38], the Theta Numbers[39], the Array Number Zero[40], the Transrational Numbers[41] or the Division by Zero Calculus[42]. Do some preliminary research to harness the above toolchain to expand polysign numbers.

(3) The Tetrahedron and Quaternions
Elaborate a report/summary on the article 'Quaternions and Projective Geometry' written by Charles Jasper Joly[43], focusing in the study of the tetrahedron.

(4) Pre-folding sumtiplicative doppelgänger
Previous to 'folding' (equivalence relation) being 'applied', investigate the properties of a product and its sumtiplicative counterpart (this is, the product in consideration, but where the addition is exchanged by multiplication in each component), and the relationship between the two. Follow the research lines of Roger Beresford. See [75] and [76].

If you have the product
(a,b,c,d)·(e,f,g,h) := (ah+bg+cf+de , ae+bh+cg+df , af+be+ch+dg , ag+bf+ce+dh)

its sumtiplicative partner is
(a,b,c,d)⋆(e,f,g,h) := ((a+h)(b+g)(c+f)(d+e) , (a+e)(b+h)(c+g)(d+f) , (a+f)(b+e)(c+h)(d+g) , (a+g)(b+f)(c+e)(d+h))

(5) 'Polytopes' of the Pascal's Pentahedroid

Research the properties of the ternary hypercube and orthoplex (polytopes whose edges have three points), under the light of the coefficients given by the pascal's pentahedroid (4-simplex).

(6) Köplingerian challenge
"Well, and then there are what I call "quatquats", some quaternary product in four dimensions, that seems to also have composition property, seems to have quaternion (or quaternion-like) subalgebras in some slices, but cannot be faithfully represented through a combination of binary products". Advisor for this challenge is Jens Köplinger.

(7) Ternary Cognitive operations
Develops a framework able to account for ternary artifacts of formal operations, and also, content operations, regarding the sphere of cognition in humans. See[44].

(8) Polysigns enhanced with isodual numbers and isostraight axes
How the Santilli's Isodual numbers[45] (and related multiplication) can enhance polysigned numbers ? How the Santilli's advances with isonumbers applied to geometry can enhance polysign numbers ? Also see[46],[47].

(9) Origami Numbers
Is there some other way to characterize Origami Numbers besides those mentioned in [71]. Some other mathematical structure behind the Origami ?

(10) Hamiltonian Numeral system
Present a 'non-abelian' counterpart of a positional/numeral system

(11) Cubical report through the Ages
Elaborate a detailed report, weakly on the historic, and strong in the technical, regarding cubic equations, and the approaches to a solution.

(12) A report on ternary distances
Elaborate a detailed report regarding distances for three points.

(13) Under the hood of Sign Rules
In [48], Alberto A. Martinez writes several considerations regarding sign rules. What is the geometry behind sign rules? Do research regarding sign rules with two and three signs.

(14) Ternary cross-like p4 product
Study some ternary version of the cross-like product presented in [2].

(15) Also for those not-three-in-line triangles
Elaborate some artifact, to enable centers, theorems and coordinates regarding triangles, be extended for degenerated triangles.

(16) A linguictic study on Polysigns
Golden writes :

> "As flattered as I am to see my name in your print, I have to express that the signon needn't be treated as a building block. This certainly is not my own frame of thought. I find the signon only after substantial work in generalizing sign. It is upon studying lattice concepts and spatial packing that the signon comes to light. Plenty of math is available without the signon, which is so named after the polygon, but is sign-based and is simply stepping in every sign direction once and with every permutation. In P3 this establishes a hexagon and in P4 a rhombic dodecahedron, though because the steps are directed and unidirectional in nature, and as paths emanate from the center of these objects, there is more structure to the signon than these simple shapes that are named. The signon is general dimensional, and that in P2 we are looking at double segments is of interest as well. This is the one stage where what is generally unidirectional takes a bidirectional geometry simply due to the exact opposition of the two signed system -1+1=0."

Research polysigned concepts and its associated etymology, semantics, syntax, graphemics and phonetics, to produce a list if linguistic-related issues to be approached in the near future. See [49],[50].

(17) Synthetic Tropical Geometry
Present a synthetic-geometric substrate for tropical geometry.

(18) Sign rule for polysign Numbers

In [51] can be observed an extension of the Descartes's rule of signs. Research an extension of the concept for polysigned numbers endowed with the usual product, or the pacman product.

(19) Curly roots
Do research on curly roots[52], and genetically-altered root-like operations.

(20) Pacmanian Reciprocal of Polysigned Numbers
Build a general algorithm to obtain the left and right multiplicative inverses of any polysigned number in Pn endowed with the pacman product[2].

(21) A Trircle (Ternary Circle) in T12
Conics are one of cornerstones of geometry, and the circle, a sort of archetype. Analitically, define a Trircle, a sort of circle-like object, with a triameter (that connects antripodal or, triametrically opposite points), in T12 coordinates.

(22) Dynamics and geometry behind three-sided relations
Present a research on three-sided mathematical relations, three-sided equality-inspired relations, and the associated geometric interpretation.

(23) Avoiding Alternancy
A native feature in the resolution of equations is its built-in alternant nature, that can be observed in the Viète's formulas and alternating polynomials, a "consequence" of the rules of signs and also, due to how the solution set is merged into one equation, together with the style of exclusion-of-multiplicities. Can more signs be effectively employed to avoid this ingrained feature in the resolution of polynomial equations, by means of variations in the process of 'merging the solutions', and/or, by means of variations of the structure of the zeroes ?

(24) Triangle-powered Transforms
Taking inspiration from the Boustrophedon transform, research new transforms using introjective coordinates[18] or other triangle-related coordinates for triangular arrays.

(25) Triangular arrays and Numeral Systems
Tweak the structural elements of positional number systems, to research numeral systems associated with triangular arrays, not just 'line-based'.

(26) Pentasphericals and tetrahedricals
What is the relation between pentaspherical coordinates, the configurations of four points in space, and the geometry of the tetrahedra ? See [53],[54].

(27) Quintic Groundwork for the T20 and the T30 system
Research the dodecahedrical T20 system (with its tetrahedra) and the icosidodecahedrical T20 system (with its pentagons and octahedra, and planar p5 numbers endowed with the usual or the pacman p5 product) and its connection to the resolution of quintic equations. Advisor for this predicament is Vinicius Claudino Ferraz.

(28) Curves and Surfaces à la triangulaire
Elaborate a catallog of curves in ternays, and surfaces in quadrays.

(29) Continuation of the Renaissance Cubic
Continue the work of Cardano[55] and Tartaglia on cubics, according the mathematical context of the epoch.

(30) All possible quanquandicular turns for a p4 number
Is there some native unitary-root-like operation, some coordinate system, some algorithm that can naturally explain all possible quanquandicular turns for a p4 number, in the same way that the unitary cubic root can account for tertendicular turns of a p3 number? This question is also on the core of what happen in the jump from p3 to p4.

Goldsmith's Picnics : a succession of usenet-less chants with goldliness essense

(1) forma picnic : once and for all, solve the 3x+1 problem

(2) ōþer picnic : solve the No-three-in-line problem [discrete geometry]

(3) þridda picnic : solve the Heilbronn triangle problem [discrete geometry]

(4) fēorþa picnic : solve the Kobon triangle problem [combinatorial geometry]

(5) fīfta picnic : solve the Carathéodory conjecture [differential geometry]

(6) sixta picnic : solve the Erdős–Straus conjecture [graph theory]

(7) seofoþa picnic : solve the 1/3–2/3 conjecture [posets]

(8) eahtoþa picnic : solve the Sums of three cubes problem [integers]

(9) nigoþa picnic : solve the X + Y sorting problem

(10) tēoþa picnic : solve the Sum of four cubes problem [integers]

(11) endlefta picnic : solve the spherical Kakeya problem [on the surface of a sphere]

(12) twelfta picnic : most efficient algorithm for Cubic Sieve Congruences

(13) þrēottēoþa picnic : solve the problem about minimum volume (closed surface) shape with constant width

(14) fēowertēoþa picnic : solve the Navier–Stokes existence and smoothness [fluid mechanics]

(15) fīftēoþa picnic : solve the Erdős–Gyárfás conjecture [graph theory]

(16) sixtēoþa picnic : build a humanly-digestable proof of the Four color Theorem [graph theory]

(17) seofontēoþa picnic : solve the Sum of Square Roots problem [problem 33 of The Open Problems Project]

(18) eahtatēoþa picnic : solve the Hamiltonian Tetrahedralizations problem [problem 29 of The Open Problems Project]

(19) nigontēoþa picnic : solve the Mahler's 3/2 problem

(20) twēntigoþa picnic : solve the Erdős–Oler conjecture [Circle packing]

(21) ān and twēntigoþa picnic : solve the Singmaster's conjecture [pascal triangle]

(22) twā and twēntigoþa picnic : solve the Chinese Postman problem [graph theory]

(23) þrēo and twēntigoþa picnic : solve the Zauner's conjecture [SIC-POVM]

(24) fēower and twēntigoþa picnic : solve the Borromean Rings conjecture [posed by Matthew Cook]

(25) fīf and twēntigoþa picnic : Solve the 3SUM problem

(26) siex and twēntigoþa picnic : solve the Pollock tetrahedral numbers conjecture [integers]

(27) seofon and twēntigoþa picnic : solve The Unknotting problem

(28) eahta and twēntigoþa picni : solve the Perfect Euler Brick problem

(29) nigon and twēntigoþa picnic : solve the Three-body problem with a closed-form solution

(30) þrītigoþa picnic : completely and finally, solve the 3x-1 problem

Gold-digger's Perplexities : a sort of usenetic-ludic conundrums with goldeonic effleurage

(1) A comprehensive Meme-oriented framework
Meme-driven machinery is abundant, like memeplexes, memetic warfare, mememorphism, meme engineering, memetic computing, memetic quotient(MQ) or memeware, to name a few. But, a deep comprehensive theory behind the meme is required. See [56].

(2) Upstream Contamination !?
More research regarding the phenomenon of upstream contamination is required.

(3) LIMS's challenge 17 : Mathematical dualities
Dualities play a key role in how we form insights in physics and mathematics. Examples include the Geometric Langlands correspondence, dualities across quantum field and string theories, and the ADE classification. Are dualities an artefact of how we decipher new theories, or do they have a more fundamental cause? Can we systematise them to discover more?

(4) Right-handedness
Why right-handedness is predominant over left-handedness ?

(5) The Art of Esoteric Computer Programming
Produce the esoteric version of TAOCP (The Art of Computer Programming), considering esoteric structures and associated machinery. Advisor for this perplexity is Donald Knuth (communication by letter is possible).

(6) Beyond Gödel, Escher, Bach
Collaborate with Trouglas R. Hofstadter on
'Trialogue, Trialectic, Triagram ∴ Triply Treacherous Throng ∵ Trichotomous Ternialic Trip'.

(7) Tritland, a romance in many trimensions
Do a continuation of 'Flatland: A Romance of Many Dimensions' written by Edwin Abbott Abbott.

(8) The Set of visual variables in 3d
Do a continuation of the Jacques Bertin's Semiology of Graphics (Sémiologie Graphique) for the three-dimensional space.

(9) Dot trit
Implement the top-level domain .trit

(10) Πλουτώνιο Mathematica
Once and for all, build the lines of communication with Αρχιμήδης Πλουτώνιο, and code the software that gives life to his non-orthodox mathematical framework. A supplementary comprehensive Wiki is also needed.

(11) OCM Foundations of Mathematics
Develope a unified mathematical framework after the work of Peter Olcott, Graham Cooper and Wolfgang Mückenheim.

(12) Trifocal tensors
More research about trifocal tensors is needed.

(13) A personal computer for supertaks
Make a physical implementation of hypercomputation. Advisor for this perplexity is Mark Burgin and Steve Wozniak.

(14) Tritaph theory
Research idealised abstract graph-like artifacts with three basic structural elements, instead of the traditional graphs (with vertices and edges), using machinery of graph theory, and combinatorial tools. Advisors for this perplexity are Carlos Zapata-Carratala and Xerxes D. Arsiwalla.

(15) CTMU Triality
More research regarding the concept of Triality[57] in the context of Langan's CTMU is required.

(16) An affordable 3d pen
Research to make 3d pens[58] more affordable/accesible is needed.

(17) Geometry behind the shape of nuclei
More research about the true shape of nucleus in chemical elements is required. Advisor for this perplexity is Alan Charles Folmsbee[59].

(18) Trinverse element in AA
Elaborate on the concept of trinverse element for Abstract Algebra. Advisor for this perplexity is Hagen Von Eitzen.

(19) Hexaplop perplexity
Current text editors, spreadsheets, pixel systems, GUIs and diagrams have a predominant square-like design. Make a text editor (or extend an existing one) to implement arrangements of characters in triangular/hexagonal fashion, for mathematical endeavors such as facilitating ternalities in mathematical prose. A competitor for the Unicode[80] is also needed. Advisor for this challenge is James Parry.

(20) Not just perpendicularity
Research physical phenomenons that are better described by tertendicularity (and quatquandicularity) instead of strictly recurring to perpendicularity alone, like the Plateau's laws.

(21) Fractal instruments and fractal-enhanced skills for playing music
Design a musical intrument (like a piano) and enhance the human capacities, this is, an instrument designed for a being with a fractal hand, able to play infinite keys at once. Since is not possible to play infinite keys for humans, mathematical series (classical or stochastic), and other associated infinitary tools will be the means to achieve it. Advisors for this perplexity are Ross A. Finlayson, Chris Thomasson and FromTheRafters.

(22) The prevalent data estructures and the structural landscape
The Tree is still, one of the dominant strutures these days. Will the tree structure be dethroned by some other, like directed acyclic graphs, hypergraphs, structures with loops, or some other, regarding end-users, theorists and designers ? Will that structure have an associated number system/encoding? how will be the landscape of data structures in the near future ?

(23) The ultimate ANT List
Extend the Ant List to include all possible ants, in posts associated to Wolfgang Mückenheim (at sci.math, sci.logic, de.sci.mathematik, and other forums).

(24) Universal Theatre of Ants
Take the endless Wolfgang Mückenheim's threads, and, by means of a software specalized in RPG Creation (like easyRPG or more modern software), design a RPG, to understand the Mückenheim terminology regarding the infinite and set theory related topics, through stage play (staging), where the ants are the main characters that embody and give birth to Mückenheim's machinery, and associated threads.

(25) Ants foundations of Mathematics
"Think of an Ant as point or numbers, the meanings tend to move around therefore these numbers/points/groups have legs, like Ants." Produce new mathematical foundations, but, strongly based on a careful study of real-world ants, mathematical foundations, and with strong inspiration on the ant list. See [60] and [61].

(26) Super Mario Bross in 4d
Design and code the mathematics and geometry behind the hypernintendo game 'Hyper Mario Bross' (the adventures of Mario and Luigi in a 4d kingdom) making use of 3d descriptive geometry of 4d objects, and other exotic (or conventional) geometry topics. Advisors of this perplexity are members of the sci.math council. Also see[62].

(27) Finis terrae of the Liar Paradox
Research the logical confines of the Liar paradox and beyond, using Dogelog, DC-Proof and Coq.

(28) Remote machinery and Polysigns

It can be observed that the way Golden describes the very anatomy of Polysigned Terms is (sign)magnitude, different compared to Real Numbers. The anatomy of Real Numbers can be observed through artifacts like the Sign Function, the Absolute Value, Law of Trichotomy and Negation(involution). Signed-digit representations like Balanced Ternary can be supplementary in this context of explaining the anatomy of real numbers. The word 'sign' have a different "meaning" in each anatomy, specifically, while comparing real numbers with reduced p2 numbers, similar to comparing structures in two closely related human languages. In virtue of those structural differences between real numbers and polysign numbers, do research to leverage Bassam Karzeddin's constructibility-oriented arithmetic (with his number system without zero) and John Gabriel's Geometric Arithmetic, for polysigned endeavors.

(29) The human third rhythm
The Cranial Rhythmic Impulse (CRI) is a third rate[63], besides the heart rate and the respiratory rate. More research is needed.

(30) The Dimensional Beyond of Bucky's dimensionality
Can the Buckminster Fuller's geometrical framework be used to extend dimensionality and space (more dimensions) in a way different to that paved by the euclidean hypercube-and-simplex type-of-dimensions ?

Gouldini's Pursuits : a sequence of usenetrical-log checkpoints with goldentrical examination

(1) Cartoon physics
Present the theoretical physics behind Cartoon Physics. See [65],[66].

(2) Origin of homochirality
Research the origins of homochirality in living beings.

(3) The Figure of the Earth
It has been called the mother of all conspiracies. The progress of the internet has generated a strengthening of the communities of supporters of the Flat and Hollow Earth. Design the ultimate experiment taking into account all the objections elaborated by adversaries of the Geoid ball-like Earth (and the criticism of the content generated by government space agencies), to determining the true shape of the Earth.

(4) A threeling operation
Design an (intrinsically) ternary arithmetic-numerical addition-like operation (and its set-theoretic counterpart). Advisor for this pursuit is Graham Cooper.

(5) The Prime Sieve Carnival
A major compilation of amateur and professional prime sieves is required, in order to harness the current knowledge in the area for future generations of researchers to tackle new knowledge regarding randomness and uncertainty in mathematics. Advisor for this pursuit are Barry Schwarz, Pubkeybreaker, Dan Joyce and Ross A. Finlayson.

(6) Massive Successive Barter
Construct a protocol/software to coordinate massive barter in succession (long series of exchanges), minimazing the number of monetary transactions, and maximizing the number of resource transactions.

(7) Infranill quantities, A rebellion against Raemschianism
Extend non-negative numbers beyond the zero in a way different of that given by the negative numbers, that is, quantities smaller than any finite (and nill) quantities.

(8) The logic of Biases
What is the logic behind human cognitive biases. Advisors for this pursuit are the members of the sci.logic council (council currently being impacted by a UFABET thai flu and associated strains)

(9) DARPA's Challenge Six : Computational Duality

Duality in mathematics has been a profound tool for theoretical understanding. Can it be extended to develop principled computational techniques where duality and geometry are the basis for novel algorithms?

(10) Mega-structure to foster Geometry
Using the structure (of 27 vertices and 27 hyperedges) posted on[67] as a basis, present a mega-estructure to be the home of a future World Expo dedicated to present advances in practical and theoretical geometry. Advisor for this pursuit is Bassam Karzeddin.

(11) Polymeric Falcighol for the people
Open the Polymeric Falcighol Derivation algorithm for general public.

(12) Tritnet
Design the successor of the usenet, to be ready in case of sudden demise, imminent collapse and/or spam-related deseases. Advisors for this mega-pursuit are vagrant programmers at the big 8 and alt hierarchies.

(13) Man-Animal-Machine–Environment System Engineering
Following the style of the Man-Machine-Environment System Engineering of Hsue-Shen Tsien, add a fourth variable, to study the confines of the observable environment, in interaction and cooperation with animals, and the machine.

(14) Total Enclosure City System
According to Jacque Fresco, many current problems are insurmountable in the cities we live in, but solvable within his city system design. Build a city following his line of work, to test his claims.

(15) Computable Freedom
More research of "Freedom as a computable function...", in the context of Viable System Model of Stafford Beer, is needed.

(16) Comprehensive TOE
Once and for all, present a comprehensive Theory of Everything. Advisor for this comprehensive pursuit is Ross A. Finlayson.

(17) Synthetic-free social units, How big
What is the upper size limit for social units, while being free of synthetic media? what does cognitive, network and social science can say in this regard? Advisor for this pursuit is Alexandra Elbakyan.

(18) Tatrix vs Matrix
Write a sequel of the Matrix (the movie), but using ternary versions of philosophical and computational concepts. Advisors for this pursuit are Timothy Golden, Roberto Siqueira Costa, Wachowski Brothers and Ross A. Finalayson.

(19) Defensive Weather Warfare
Proposals for machines dedicated to defensive weather warfare (against natural or manmade weather related catastrophes) are required. Advisor for this pursuit is James McGinn.

(20) Hypernintendo
Hyper Nintendo is a the game console capable of producing 3d imagery. Propose the physical system behind this console (through optoelectronics or by other means). Advisors for this pursuit are Wolfgang Mückenheim and Timothy Golden.

(21) Beyond optimization
It has been said 'premature optimization is the root of all evil'. What lies beyond Automatization and Optimization for humans? Advisor for this pursuit is Amine Moulay Ramdane.

(22) Trieb through art
It is difficult to capture the essence of drives (Trieb) with words. Design a major artistic definition/classification/language for drives.

(23) A theory of Consciousness
Elaborate a theory able to describe the whole gamut of lower and upper (and other not-well-understood) states of consciousness. See [68],[69] and [70].

(24) Time-fractional differential equations calculator
Present research to implement a reliable calculator for time-fractional differential equations. Advisors for this pursuits are Dr Huang and Ross A. Finalayson.

(25) Next-gen quantities
Quantity calculus is waiting for the next-generation quantity systems. Advisor for this pursuit is the Socratis T.n.p.

(26) Novel propulsion systems
Propose new propulsion system beyond known physics. Advisor for this pursuit is Arindam Banerjee.

(27) Unstick those wrists
Propose novel geometric methods to 'dissolve' the wrist flip problem for robotic arms.

(28) The ocular third way
More research regarding Nonvisual Pathways[82] (the third way of the eye) in the context of cognitive science is required.

(29) Mathematics beyond polynomials
Polynomials are a great mathematical tool, and in a certain sense, they represent a possible way in which information is threaded. Do exist some mathematical successor for polynomials? Advisor for this pursuit is Tommy1729.

(30) Bit-wise loose ends
"Bitcoin is a predicate machine...", how should we understand "predicate machine"? asked by the dogelogician Burse, for the sci.logic council.

Resources

[1] Israel A. González Medin (9 september 2020), A new proposal to the extension of complex numbers
[2] Tanaka (Jul 2021), Pacman Product for Polysigned numbers
[3] Kavosh Havaledarnejad, Chromatic Numbers and Ternary Algebra
[4] Jürgen Richter-Gebert, Bernd Sturmfels, Thorsten Theobald (9 december 2003), First Steps in Tropical Geometry v2
[5] Clark Kimberling, Bicentric Pairs of Points and Related Triangle Centers
[6] Paul Yiu (2001), Introduction to the Geometry of the Triangle
[7] Gábor N. Sárközy (August 13, 2008), https://web.cs.wpi.edu/~gsarkozy/Cikkek/Rio08.pdf , Cycles in Hypergraphs
[8] Heron-like Hedronometric Results for Tetrahedral Volume - Blue, the hedronometer (12 November, 2008
[9] Timothy F. Havel - (april 17, 2022/ May 22, 2023), An Extension of Heron's Formula to Tetrahedra, and the Projective Nature of Its Zeros
[10] Timothy Golden, https://drive.google.com/drive/folders/1xLjsTXOYvHeVau__OCKAHOBZIyps0cRh , Tetraspace
[11] Wolfgang W. Däumler (January 2020) Replacement of the Riemann Sphere by a Horn Torus ('doughnut') and Conformal Mappings between Plane, Sphere and Horn Torus
[12] Vyacheslav Puha, https://www.horntorus.com/manifolds/conformal.html
[13] Timothy Golden, http://www.bandtechnology.com/PolySigned/Lattice/Lattice.html , Lattice Study of Polysigned Numbers, Signon Study
[14] Clifford J. Nelson (1996/May 2, 2016), https://www.wolframcloud.com/objects/nbarch/2018/10/2018-10-10qnpbj/SynergeticsCoordinatesDemo2.nb , Synergetics Coordinates Applications
[15] Eric Weisstein, https://mathworld.wolfram.com/SynergeticsCoordinates.html , "Synergetics Coordinates."
[16] Wayne Roberts, https://www.principlesofnature.com/number_geometry_connections/extending_the_geometry_of_triangles.htm
[17] Kirby Urner, https://www.academia.edu/61407203/Tetravolumes_with_Quadrays , Tetravolumes with Quadrays
[18] L. Jan Torres - (September 12, 2022) - On the art of threesomes
[19] Wayne Roberts, Principles of Nature, towards a new visual language
[20] John A. Shuster (2023), "What's inside ZerO?" 'Theta Numbers' and other possibilities within an 'Evolving-O'
[21] C. D. Olds, Anneli Lax, Giuliana P. Davidoff (2000), Geometry of Numbers
[22] William Bricken (2019), Iconic Arithmetic simple sensual postsymbolic Volume I The Design of Mathematics for human understanding
[23] William Bricken (2019), Iconic Arithmetic simple sensual postsymbolic Volume II Symbolic and Postsymbolic Formal Foundations

[24] William Bricken (2021), Iconic Arithmetic simple sensual postsymbolic Volume III The Structure of Imaginary and Infinite Forms
[25] Kujonai (2020), Notas Sobre Polisignos Y Objetos Tertiarios
[26] Timothy Golden, http://www.bandtechnology.com/PolySigned/MagnitudeSweep/index.html
[27] Timothy Golden, https://drive.google.com/file/d/1Vvqq2f_Ch6IozwNimJjcS4kw3tnVmtPd/view
[28] Shinji Tanimoto (2007), A novel operation associated with Gauss' arithmetic-geometric means
[29] A. C. Dixon (1890), On the doubly periodic functions arising out of the curve x^3 + y^3 - 3 alpha xy = 1 [Quarterly J. Pure Appl. Math. 24 (1890), 167-233]
[30] Luis Teia (Jun 15, 2023), https://gammatrigonometry.pubpub.org/pub/5meozrd0/release/1 , Gamma Derivatives
[31] Luis Teia (September 2021), Extended Pythagoras Theorem using Triangles, and its Applications to Engineering
[32] Luis Teia (Jun 12, 2023), https://gammatrigonometry.pubpub.org/pub/x7yacznz/release/1 , Gamma Sine/Cosine
[33] A197374, https://oeis.org/A197374, Pi(3): fundamental real period of the Dixonian elliptic functions sm(z) and cm(z)
[34] A104133, https://oeis.org/A104133, Coefficient of x^(3n+1)/(3n+1)! in the Maclaurin expansion of the Dixon elliptic function sm(x,0)
[35] A104134, https://oeis.org/A104134, Coefficient of x^(3n)/(3n)! in the Maclaurin expansion of the Dixon elliptic function cm(x,0)
[36] Roland Bacher, Philippe Flajolet (May 31 2009), Pseudo-factorials, elliptic functions, and continued fractions
[37] Eric van Fossen Conrad, Philippe Flajolet (13 July 2005), The Fermat cubic, elliptic functions, continued fractions, and a combinatorial excursion
[38] Mohammed Abubakr (Jan 2011), https://arxiv.org/abs/1101.2798 , On Logical Extension of Algebraic Division
[39] John A. Shuster (May 2023), "What's inside ZerO?" 'Theta Numbers' and other possibilities within an 'Evolving-O'
[40] Jonathan Cender (2018), A new and improved number zero in an extended number system
[41] Jan Aldert Bergstra, John V. Tucker (2020), The Transrational Numbers as an Abstract Data Type
[42] Saburou Saitoh (2021), Introduction to the Division by Zero Calculus
[43] Charles Jasper Joly (1903) - Quaternions and Projective Geometry [Philosophical Transactions of the Royal Society of London. Series A, Containing Papers of a Mathematical or Physical Character, Vol. 201 (1903), pp. 223-327]
[44] Norman D. Cook (july 9, 2018), The Triadic Roots of Human Cognition: “Mind” Is the Ability to go Beyond Dyadic Associations
[45] R.G. Santilli (January 1, 2006), Isodual Theory of Antimatter: with applications to Antigravity, Grand Unification and Cosmology
[46] R.G. Santilli, http://www.mathem.pub.ro/proc/bsgp-01/K01-0SA.PDF , Isotopic liftings of the pythagorean theorem, trigonometric and hyperbolic functions
[47] Svetlin G. Georgiev (2022), Foundations of Iso-Differential Calculus, Volume I
[48] Alberto A. Martínez (2006), negative math how mathematical rules can be positively bent
[49] Anthony Lo Bello, Origins of Mathematical Words A Comprehensive Dictionary of Latin, Greek, and Arabic Roots
[50] Steven Schwartzman, The Words of Mathematics An Etymological Dictionary of Mathematical Terms used in English
[51] B.D.S. “Don” McConnell, The Descartes Rule of Sweeps and the Descartes Signature
[52] Dan Kalman, Maurice Burke, Solving Cubic Equations with Curly Roots
[53] David F. Barrow, Oriented circles in space
[54] Julian Coolidge, A Treatise on the Circle and the Sphere
[55] Sara Confalonieri (January 2015), The Unattainable Attempt to Avoid the Casus Irreducibilis for Cubic Equations Gerolamo Cardano's De Regula Aliza
[56] Susan Hurley and Nick Chater [editors] (2005), Perspectives on Imitation: From Neuroscience to Social Science Volume 1: Mechanisms of Imitation and Imitation in Animals
[57] CTMU Wiki, https://ctmucommunity.org/wiki/Triality , Triality
[58] Oi-Lam Ng, Nathalie Sinclair (May 15 2018), Drawing in Space: Doing Mathematics with 3D Pens
[59] Alan Charles Folmsbee, Charge distributions on the nuclei
[60] AntWiki, https://antwiki.org/wiki/Welcome_to_AntWiki
[61] thread 'The ANT LIST V 6.0' (Aug 19, 2021), https://groups.google.com/g/sci.math/c/cjDeLUEYXy0/
[62] Lalo Te (2020), Como acercar la geometria 4d al publico general
[64] Thomas Rosenkilde Rasmussen, Karl Christian Meulengracht (2021), Direct measurement of the rhythmic motions of the human head identifies a third rhythm
[65] Power Listing fandom wiki, https://powerlisting.fandom.com/wiki/Cartoon_Physics , Cartoon Physics
[66] Wikipedia, https://en.wikipedia.org/wiki/Cartoon_physics , Cartoon physics
[67] Math SE, https://math.stackexchange.com/questions/512581/what-is-a-cycle-hypergraph , What is a cycle hypergraph?
[68] Rocco J. Gennaro[editor], Disturbed Consciousness New Essays on Psychopathology and Theories of Consciousness
[69] Elaine Perry, Daniel Collerton, Fiona LeBeau, Heather Ashton, New Horizons in the Neuroscience of Consciousness
[70] Hiroshi Motoyama [Translation by: Shigenori Nagatomo and Clifford R. Ames], Toward a Superconsciousness: Meditational Theory & Practice
[71] Thomas C. Hull (2020), Origametry Mathematical Methods in Paper Folding

[72] thread 'Bitcoin’s Greatest Feature Is Also Its Existential Threat'(May 15, 2021), https://groups.google.com/g/sci.physics/c/LWuGnoWWwe0
[73] Vassil Dimitrov, Graham Jullien, Roberto Muscedere (2012), Multiple-Base Number System: Theory and Applications
[74] Christophe Doche, David R. Kohel, Francesco Sica (September 2008), Double-Base Number System for Multi-Scalar Multiplications
[75] R.H.Beresford, Hoop Algebra Supplement, https://library.wolfram.com/infocenter/MathSource/6198/
[76] R.H.Beresford, Hoops&Physics.doc, https://library.wolfram.com/infocenter/MathSource/6198/
[77] Douglas Hofstadter (1979), Gödel, Escher, Bach: an Eternal Golden Braid
[78] Edwin Abbott Abbott (1884), Flatland: A Romance of Many Dimensions
[79] Jacques Bertin (1967), Sémiologie Graphique
[80] Alexander Egorov, Duocode, a parallel of the unicode standard for hexagonal typesetting
[81] Mauri Valtonen, Joanna Anosova, Konstantin Kholshevnikov, Aleksandr Mylläri, Victor Orlov, Kiyotaka Tanikawa (2016), The Three-body Problem from Pythagoras to Hawking
[82] Clark Elliott (2015), The Ghost in My Brain
[83] Tanaka (September 3, 2022), On intertwined polysigned p3 and equatorial geometry
[84] Roberto Siqueira Costa, Lua Digital: Matemática
[85] Raffaele Pisano, Danilo Capecchi (2016), Tartaglia’s Science of Weights and Mechanics in the Sixteenth Century Selections from Quesiti et inventioni diverse: Books VII–VIII
[86] Hagen von Eitzen (February 23, 2009), "Understanding Polysign Numbers the Standard Way"
[87] Florian Cajori (1928 and 1929), "A history of mathematical notations" Volume I and II
[88] Carlos Zapata-Carratala, Xerxes D. Arsiwalla (Jan 21, 2022), An Invitation to Higher Arity Science
[89] Tanaka (October 15, 2022), Timothy Golden and Tersymmetrical Suppression Conspiracy
[90] Timothy Golden, "Golden's Homepage", http://www.bandtechnology.com/

バッタ たなか signing off 。
October 6 ＋ @ ＋ ＊

```
/*
*-----------------------------------------------------------------------------
* "THE CHANOYU-WARE LICENSE" (Revision 01):
* Tanaka wrote this file. As long as you retain this notice you
* can do whatever you want with this stuff. If we meet some day, and you think
* this stuff is worth it, you can invite me a tea in return Tanaka
* TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION
* 0. Stop whining for a minute.
* 1. You just DO WHAT THE FUCK YOU WANT TO.
*-----------------------------------------------------------------------------
*/
```

```
/*
* Warning : The chosen branch of the Goldner's Puzzles, Goldeyson's Predicaments,
* Goldsmith's Picnics, Golddigger's Perplexities and Gouldini's Pursuits are currently
* unstable, use with caution.
*/
```

// Tribute to the Polysigned numbers, Acme Corporation and the Usenet groups

// Tribute to the Ant List, the Hypercomplex number List

// Thanks to the threesologist Herb O. Buckland

// Thanks to the Nakamoto's brothers, Ternochi, Santochi and Trinochi

// Implemented as many resources/drafts of the Ternary frog, as possible

// Very thankful to the reports of Ethan Hunt and Ilsa Faust of the IMF

// Goldesian Trialism or Cartesian Dualism

// Connective constant of the hexagonal lattice

// Lattices of Daves Carthin

// Novel reports point out that ゴールデン・P・ティム is currently travelling the Grand Line

// Ternialic (or ternalic) to refer to opposites, ternary (or triadic) to refer to arity, and triassic to refer to both (opposites and arity)

```
/*
* Yannis Picart's algorithm
* Should polysign numbers encompass linear algebra? ( Jun 4, 2023)
* https://groups.google.com/g/sci.math/c/wsvQXs7MF0w
```

```
*/

/*
* Resolution of any of the problems is a meeting with Donant Knuth, Steve Wozniant and
* Alexandra Elbakyant
*/

// Thanks to the Proof department, and to the Halting department

/*
* The correct date of reference [2] of 'On intertwined polysigned p3...' is (Jul 6, 2022 /
* Sep 6, 2022), not (May 28, 2006 / Jun 25, 2006)
*/

// Tribute to Martin Gardner

// Polysign without an origin ?

// Dihedral rhombic dodecahedron

// Notice that is possible to find some literature on three-stances

// Geometric algebra

// Not exactly similar to Bruhat-Tits tree

// Equipollent line tregments

// "more of a lark than a labor"

/*
* Very thankful of the timely reports of Anthony Nantes Thantuqo (Santa Fe branch),
* Gerant Bantler (Atlanta branch) and Konstantin Turántisburg Mantorov (Taganrog branch),
* Bureau of The Septagon.
*/

// Löschian numbers

// The word 'magnelar' was replaced by the word 'magnitudinal'

// Very thankful to major encyclopedias that accommodate current mathematical knowledge

// The threeshold for the eccen-tricity dosage has been meet

// the word 'ternagation' was used Beresford

// Goldenian constant and the Eulerian constant

// "being as a topos" of Hiroshi Motoyama

// Thanks to the triangle, hexagon and dozenal communities
```